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with some modification, will apply to the whole nation. "They were a peculiar people; good-natured as a rule, but high-tempered; industrious, and yet as haughty as the laziest Indians on the continent. They had more of that commendable pride which makes men desire to be independent and self-respecting than any of their neighbors. They were inclined to be exclusive in their social relations, but even among themselves there was little merrymaking. They took a more serious view of life and its duties. Stubbornness and strong will were tribal characteristics. In features they were rugged and strong, the cheek-bones large and prominent, the hair thick and coarse, the face heavy and not much wrinkled in old age." Of their congeners, the "Upper Klamaths," the same writer says, "They were a finely formed, energetic, and cleanly race." Mr. Gatschet confirms in general these descriptions, but adds: "The Mongolian features of prognathism and of high cheek-bones are not very marked in this upland race, though more among the Modocs than in the northern branch. If it were not for a somewhat darker complexion and a strange expression of the eye, it would be almost impossible to distinguish many of the Eukshikni men from Americans." Their complexion is so nearly white that "blushing is easily perceptible, though the change in color is not great." The hair is straight and dark; and he remarks, "I did not find it very coarse, though with many Modoc women it is said to be so, and to grow to an extreme length."

It is worthy of note that the complexion and other physical characteristics of the Indians of western America vary in marked connection with the "environment," that is, with the climate, food, and mode of life. The natives of northern British Columbia, the Thlingits (or Thlinkeets) and Haidas, are as light of hue as Europeans. They often have ruddy cheeks, brown or blue eyes, and red or brown and wavy or curly hair. As we pass southward along the coast, successively to the Nootkans, the Chinooks, and the other tribes of southern British Columbia, Washington, Oregon, and northern California, we find the hue of the skin deepening, the eyeballs darkening, and the hair becoming coarser, until at length, under the tropical heats of central and southern California we come to tribes with almost negroid traits. These traits are described by the best authority, Mr. H. H. Bancroft, as "a complexion much darker than that of the tribes further north, often very nearly black;" "matted bushy hair;" "a low, retreating forehead, black, deep-set eyes, thick, bushy eyebrows, salient cheek-bones, a nose depressed at the root and somewhat wide spreading at the nostrils, a large mouth, with thick, prominent lips, teeth large and white, but not always regular, and rather large ears." But when we recede from the low, hot, and moist coast to the cool and dry interior uplands, the people, as in the case of the Klamaths, return to the European type. Mr. Gatschet describes particularly the small mouth of the Eukshikni, the good teeth, and the genuine Grecian profile, "the nasal ridge not aquiline but strong, and forming an almost continuous line with the forehead."

The truth is that, as one of the acutest of German anthropologists, Oscar Peschel, in his able and comprehensive treatise on the "Races of Man," has affirmed, all attempts to distinguish the various so-called races by merely physical characteristics, whether of color, hair, or the osseous framework, have proved utterly futile. As regards the shape of the head, on which so much stress has been laid, the view maintained by the late S. G. Morton, that the natives of this continent had a peculiar form of cranium, different from that of

any other people, has been shown, first by Sir Daniel Wilson in his "Prehistoric Man," and later by Dr. Virchow, in his recent work, "Crania Ethnica Americana," to be wholly incorrect. Dr. Virchow declares (in his summary read before the Congress of Americanists, at Berlin, in 1888) that he finds dolichocephalic, mesocephalic, and brachycephalic tribes scattered throughout the continent; and he pronounces in positive terms his conviction that "the cephalic index, calculated on measures of the length and breadth of the cranial vault, should not be admitted as a determining proof of the single or diverse origin of populations."

We may confidently anticipate that the series of physical measurements of all the American tribes, which, by a happy thought, Professor Putnam has instituted for the Columbus World's Fair, and on which many observers are now engaged, under the experienced supervision of Dr. Franz Boas, will result in confirming the views of Peschel, Wilson, and Virchow, and establishing the truth that physical characteristics afford no proper tests of racial affinity or diversity. We are thus brought back to the older, and, as time has proved, the infinitely stronger evidences of what may be styled the intellectual characteristics, language and mythology. That these tests sometimes fail, through mixture of stocks and adoption of foreign beliefs, is unquestionable; and we are then left in ethnology, as we are often left in other sciences — astronomy, geology, and physiology, for example — to rely on probabilities. But so far as certainty is attainable, as it often is, it can only be attained through the evidence of these special tests.

The language and mythology of the Klamath nation are of a highly interesting character; but our study of these subjects, with the ample materials and philosophic suggestions furnished by Mr. Gatschet, must be left for other articles.

HORATIO HALE.

Clint n, Ontario, Canada.

ANOTHER RIVER-PIRATE.

IN *Science*, vol. xiii., 1889, p. 108, under the title of "A River-Pirate," Professor W. M. Davis described a recent case of river capture in south-eastern Pennsylvania, brought about by the backward gnawing of one stream into the drainage area of another. In looking over with him the Doylestown sheet of the Pennsylvania Topographic Survey there were found numerous cases of similar capture, either already accomplished or about to take place, and at his suggestion the writer recently made a visit to the district in question, in the hope of being able to add something more to the history of the rivers of Pennsylvania.

The region of these migrations, Buck County, is situated in the north-eastern part of Pennsylvania (see Fig. 1), and extends for thirty-three miles (in a straight line) along the Delaware River. It is a gently rolling, well-cultivated country, composed of Mesozoic new red sandstones and shales, dipping from 5° to 15° to the north-west, the hard and soft layers of reddish sand and mud alternating. The evidence goes to show that the surface of the country has been reduced by erosion at least 1,000 feet since the time when the beds were laid down, for the upper deposits must have once overspread the gneiss ridge at the northern county line. They still rise nearly to its top, and there is no evidence of a fault, the absence of any trace of it being capable of explanation only on the supposition that extensive erosion has taken place.¹

¹ 2d Geol. Survey of Penn. 1885.

The evidence from New Jersey and Pennsylvania goes to show that after the tilting of the sandstones there came an extensive period of denudation, which resulted in the production of a more or less perfect plain, the so-called Cretaceous base-level, which can be seen in the level tops of the New Jersey Highlands and of the ridges of Pennsylvania. Following this came an elevation, giving the streams renewed energy, and resulting in the etching out of the softer rocks down to another peneplain, the Tertiary base-level. Finally another elevation gave the streams another period of activity, and it is in this cycle that we find them to-day. The larger streams, like the Delaware, have already sunk

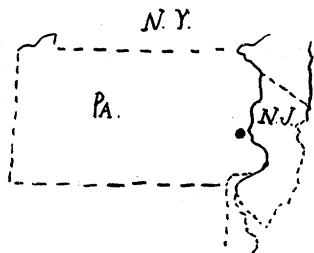


FIG. 1.

their channels well into the Tertiary peneplain. It is with some of the smaller ones that we have now to deal.

Unless something had occurred to interfere with their work in the previous cycle, which ended in the production of the Tertiary peneplain, the streams of this district should now be well adjusted to the structure. On examining the map, however, we find that many of them show a tendency to deflect downstream as they run towards the Delaware. Such an arrangement is characteristic of the tributaries of flood-plained master-streams, as is well shown in the case of the Mississippi and the Po, and may perhaps be explained in this case by the flood plaining of the Delaware during the Tertiary period of base-leveelling. Had such a flood-plaining occurred before, i.e., during the Cretaceous base-leveelling epoch, the side streams would have already become adjusted to the structure, for since Cretaceous time the whole surface of the country has been worn down some hundreds of feet. Flood-plaining such as that believed to have taken place here, seems to be characteristic of large rivers during the last stages of base-leveelling, when, with a very gentle slope, they build their deltas up-stream from their mouths, covering the country on both sides with alluvium.¹

The flood-plaining of the Delaware would give the side-streams a superimposed course on the Tertiary peneplain, and as they cut down through the cover they would find themselves flowing across the outcropping edges of the underlying strata of sandstone and shale. An arrangement of strata such as that here presented gives an admirable field for the adjustment of streams. It can be readily seen that if a side stream works back along the strike of one of these beds, it has, especially if the bed is soft, a much easier course than a stream which has to cross the edges of many hard and soft strata on its way to join the master. Perhaps this may be more easily understood from the accompanying figure (Fig. 2), reduced from the contoured map of the Pennsylvania Geological Survey, representing the district under consideration.

¹ W. M. Davis: "The Geological Dates of Origin of Certain Topographic Forms on the Atlantic Slope of the United States" (Bulletin Geol. Soc. of America, Vol. 2, p. 590); "The Rivers and Valleys of Penn." (Nat. Geog. Mag., Vol. 1, No. 3); "The Geographic Development of Northern New Jersey" (Proc. Boston Soc. Nat. Hist., XXIV., 1889).

In this case Tohickon Creek, only the lower part of which is shown, has its course directly across the strike of the beds down to the Delaware, while Tinicum Creek goes along the strike for some distance and thus has an easier course. The result has been that a branch of the Tinicum has gnawed its way back along the strike until it is now within less than half a mile of the Tohickon. The Tohickon has a descent of somewhat over twenty feet in the first mile from this point, while the branch of the Tinicum falls over eighty feet in the same distance. The distance from the present divide to the Delaware is about eight miles along the Tohickon, and about five miles along the Tinicum. It is seen, then, what an advantage the little branch of the Tinicum has over its larger rival. The region where the contest is going on is just south of the letter A in the figure, and as the more favored stream works its way further and further back, the divide will be pushed over the intervening space, and before long the Tohickon will be captured and led out by a shorter and better course through the Tinicum, leaving its lower part, beheaded, to continue its way down the Tohickon valley. The region of the divide is pretty level, being all enclosed by the 300 feet contour, with a slight slope toward the Tohickon, and a greater one toward the Tinicum, and if we get this idea of migration clearly in mind, it seems almost as if we could see the divide moving toward the Tohickon. There are few trees to protect the surface there, and the crops of potatoes and corn which cover the fields give a good opportunity for the rain to carry away the soil.

What is about to take place in the case of the Tohickon, seems to have already happened further to the east. Here again the Tinicum is the pirate. A glance at the figure will make plain the state of the case. If the Tinicum is followed

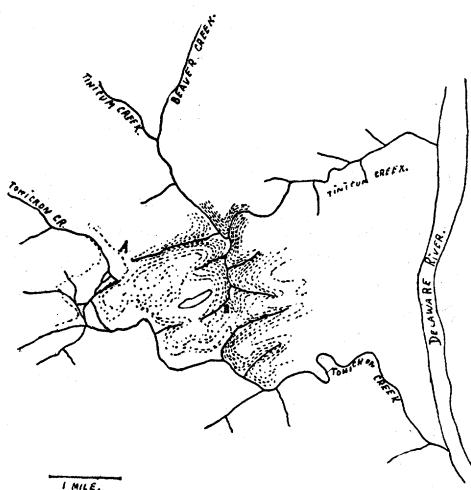


FIG. 2.

down its course to the Delaware it will be seen to make a sharp turn to the north-east just at the point where its pirate tributary comes in from the south-west. Knowing, as we do, that the easier course lies along the strike of the beds and not across it, we naturally turn to this point to see what has taken place. If on coming down the Tinicum to this point we continue to the south, we go for some distance up a small stream flowing north, which comes down to the Tinicum through a deep and rather narrow valley. Continuing our walk along this creek, we soon come to a little sheltered nook, where a picturesque farm-house stands, past which the creek flows, coming in from the south-west. We now leave the latter, and continue up a hollow to the south-east, and across

some fields, gently sloping towards a depression in the middle, until we reach another little creek, flowing south into the Tohickon. The explanation of this seems to be as follows: Beaver Creek originally flowed out to the south-east, across the present divide, into the Tohickon, having a similar course to that of the Tohickon in that it crossed the strike of the beds. Tinicum Creek, gnawing along its easier path, reached and captured Beaver Creek, at the point where the sharp turn is seen. The divide which originally stood close to the Tinicum has now been pushed south until it occupies a position close to the letter *B* in the figure.

The beheaded portion of Beaver Creek still occupies the old valley, while an inverted stream now flows north in a directly opposite direction to that of the original Beaver Creek. The old valley across the divide to the Tohickon is seen as the gentle depression in the fields.

This explanation shows us why there is the sudden turn in the Tinicum just at this point. It has worked back on its easy course until it has captured Beaver Creek, and, as shown above, is continuing its work by pushing back towards the Tohickon, which it will very soon capture in the same way.

R. DeC. WARD.

Harvard College, Oct., 1891.

ASTRONOMICAL NOTES.

M. PALMIERI, director of the Vesuvian Observatory, is responsible for the statement that all the great eruptions of Vesuvius take place at new or full moon, and especially eclipses. The eclipse of June 17, 1890, was accompanied by violent earth currents. On the other hand, Captain de Montessus, who has patiently accumulated observations and data concerning earthquakes, has now a catalogue of more than 60,000 of these phenomena, individually discussed. He establishes that earthquakes are distributed uniformly throughout the day and night, that they have no relation to moon culminations and astronomical seasons, and that such coincidences which have been claimed in the past rest on insufficient ground.

M. Janssen, the eminent French astronomer, has been attempting to find solid rock on the top of Mount Blanc, upon which to build an observatory. His scheme has been to bore galleries through the ice, but so far he has been unsuccessful, and he is considering the feasibility of founding an observatory on the ice.

In the December number of *Knowledge* will be found reproductions of photographs, taken by Dr. Max Wolf of Heidelberg, of the region of the Milky Way in the constellation Cygnus, and also in the constellation Sagittarius. Mr. Ranyard, the editor of *Knowledge*, in an article entitled "Dark Structures in the Milky Way," calls attention to several interesting facts connected with the region of the heavens shown in the photographs. One of the regions covered is that surrounding Alpha Cygnus, and directly above that star is seen a dark, branching, tree-like structure. It evidently corresponds to a branching stream of matter which cuts out the light of the nebulous background on which it seems projected, and it is evidently intimately associated with the lines of stars which border the stream and its branches on either side. A somewhat similar dark branching stream may also be traced on a photograph of the region surrounding Epsilon Cygni, a copy of which appears in the October number of the journal above quoted. Altogether the article, with its attendant photographs, is very interesting, and brings to light some new facts connected with that

region of the heavens in which the stars seem almost countless.

The small planet discovered by Dr. J. Palisa of Vienna, on Aug. 30 (now numbered 313), has been named Chaldea.

In a very interesting paper in No. 3,066 of the *Astronomische Nachrichten*, Professor Auwers gives the sun's parallax as 8.880", with a probable error of $\pm 0.022''$. This value is the result of the determination from the German Transit of Venus expeditions in 1874 and 1882, during which years 754 measurements were made. Professor Harkness, in his discussion of the results of the American Transit of Venus Commission, from the photographs alone, obtained the value 8.842" for the sun's parallax, with a probable error of $\pm 0.011''$. From a discussion of all the data obtainable, he obtained 8.80905" $\pm 0.00567''$. This latter value corresponds to a mean distance of 92,796,950 miles from the earth to the sun, while Professor Auwers's value corresponds to a distance of 91,814,000 miles.

The following is a continuation of the ephemeris of Winnecke's comet. The epoch is for Berlin midnight.

	1892	R.A.			Dec.	
		h.	m.	s.	o	'
Jan. 12		12	28	12	+ 13	38
		13		29	13	42
		14		30	13	47
		15		30	13	52
		16		31	13	57
		17		32	14	3
		18		33	14	9
		19		34	14	15
		20		35	14	22
		21		12	+ 14	28
			36	13		

The following is a continuation of the ephemeris of Wolf's comet. The epoch is for Berlin midnight.

	1892	R.A.			Dec.	
		h.	m.	s.	o	'
Jan. 11		4	16	43	- 13	2
		12		17	12	54
		13		17	12	45
		14		17	12	37
		15		18	12	28
		16		18	12	19
		17		19	12	10
		18		19	12	1
		19		20	11	52
		20		20	11	43
		21		4	- 11	33

G. A. H.

THE GRADUATE STUDENTS' ASSOCIATION OF JOHNS HOPKINS.

THE *Johns Hopkins University Circular* for November gives the names of graduate students in that university from nearly every State in the Union. Nearly all the Canadian provinces and several foreign countries are represented. These three hundred students are here, primarily for hard work, each in his specialty, in one of fourteen departments. Not a few of the students enrolled last year are now studying in European universities, with the expectation of returning to their work here at the beginning of the next year.

There must be departmental isolation in every university, but this may become extreme. The best training for a capable and cultivated manhood can be obtained only as one mingles with his fellows and shares their varied experiences. An organization